Progress Report

of the SNOWDEN GRAY SOILS SUBSTATION 1942-1954

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ALFALFA VARIETY TEST, SNOWDEN, SASKATCHEWAN

EXPERIMENTAL FARMS SERVICE
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Experimental Farms Service
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1942 - 1954
Snowden, Saskatchewan.

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INTRODUCTION

Experimental work on the gray wooded soils of northeastern Saskatchewan has mainly been confined to the Snowden Gray Soils Substation and only the experimental work done on this Substation is covered in this report. The Substation, which was established in 1942, is operated by the owner, Mr. W. D. Brown, in co-operation with the Melfort Experimental Farm on the basis of a "District Experiment Substation contract". The farm, the SW 26-52-49-2, consists of 160 acres of land one and one-half miles north and one mile west of Snowden, Sask.

The farm is on a glacial alluvial plain having an elevation of approximately 1,470 feet above sea level. The surface geology is moderately calcareous lake-washed till comparatively stone-free, frequently overlain by a sandy loam overwash to a depth of from 30 to 40 inches. The topography is gently undulating to very gently sloping with generally good drainage.

There is approximately 100 acres of tillable land on the farm and experimental testing is confined to some 30 acres of mixed Garrick and Smeaton clay loam soils. There is approximately 100,000 acres already mapped of these gray wooded soil types throughout northeastern Saskatchewan. They present serious management problems to farmers in maintaining organic matter, tilth, and soil fertility.

In maintaining crop yields on these soils, experimental studies have indicated the importance of proper soil structure, commercial fertilizers containing nitrogen and phosphorus, barnyard manure, and the use of grass legume rotations. Broad-leaved weeds have been satisfactorily controlled with chemical herbicides. However, wild oats, which have become a weed problem on gray wooded soils, require further study before they can be effectively controlled. Wind and water erosion problems which result under certain conditions from improper use of soils and crop residues must be kept to an absolute minimum due to the thin, structureless layer of topsoil which these soils contain.

METEOROLOGY

Meteorological records have been maintained on the Snowden Substation since 1943. Precipitation and temperature data for the years 1943 to 1954 are presented in Tables 1, 2, and 3.

It will be noted from the tables that the total annual precipitation has varied from a low of 12.67 inches in 1946 to a high of 22.14 inches in 1942 and 21.25 inches in 1954. The thirteen-year average annual precipitation is 16.27 inches.

The eleven-year average frost-free period (above 32°) during the growing season at Snowden was 75 days. The temperature remained above 29° on average of 103 days.

TABLE 1 - PRECIPITATION RECORDS, GRAY SOILS SUBSTATION, SNOWDEN, SASKATCHEWAN

Monthly and annual precipitation records in inches 1942 to 1954, inclusive, with 13-year averages and monthly extremes for the same period

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total annual snow-fall	Total annual rain-fall	Total annual precip-itation
1942	0.10	0.90	0.55	2.32	1.09	7.91	4.22	1.20	0.82	0.20	1.88	0.95	55.4	16.60	22.14
1943	0.60	0.60	0.47	0.22	0.78	2.38	3.45	1.31	1.83	1.71	0.18	0.35	26.5	11.23	13.88
1944	0.60	0.40	0.55	0.65	2.25	2.15	4.26	2.92	1.28	0.48	0.70	0.65	35.0	13.39	16.89
1945	0.63	0.55	0.85	2.03	1.27	3.56	1.14	1.86	2.19	0.71	1.55	0.58	76.4	9.28	16.92
1946	0.70	0.50	0.05	0.20	1.54	1.06	1.75	2.67	0.96	1.49	0.33	1.43	39.6	8.71	12.67
1947	1.75	0.53	0.48	0.33	0.69	0.63	1.42	2.27	1.51	1.21	1.80	1.25	61.4	7.73	13.87
1948	0.35	1.45	0.55	0.75	1.54	0.83	1.03	4.79	0.35	0.25	1.30	0.45	48.5	8.79	13.64
1949	0.25	1.40	0.33	0.48	1.98	4.04	2.93	1.66	1.40	0.51	1.04	0.60	32.6	13.36	16.62
1950	0.63	0.93	--	1.39	1.16	2.03	3.43	2.95	0.42	2.21	1.31	1.10	34.7	14.09	17.56
1951	0.55	0.38	2.00	0.73	2.08	1.50	2.31	2.50	2.09	1.02	0.93	0.10	56.6	9.81	16.19
1952	0.40	0.40	0.33	--	2.87	2.85	3.08	1.30	1.38	0.48	0.50	0.48	17.4	12.33	14.07
1953	1.55	0.58	2.60	0.20	0.81	2.43	2.14	1.77	1.37	--	0.75	1.63	75.1	8.32	15.83
1954	1.72	0.55	0.18	1.73	1.87	3.82	2.90	3.64	1.41	2.33	0.75	0.35	52.9	15.96	21.25
13-year average 1942-1954, inclusive	0.76	0.70	0.69	0.85	1.53	2.71	2.62	2.37	1.31	0.97	1.00	0.76	47.1	11.51	16.27
Extremes for the 13-year period 1942-1954, inclusive.															
Low	0.10	0.38	0.05	--	0.69	0.63	1.03	1.20	0.42	--	0.18	0.10	17.4	7.73	12.67
Year	1942	1951	1946	1952	1947	1947	1948	1942	1950	1953	1943	1951	1952	1947	1946
High	1.75	1.45	2.60	2.32	2.87	7.91	4.22	4.79	2.19	2.33	1.88	1.63	76.4	16.60	22.14
Year	1947	1948	1953	1942	1952	1942	1942	1948	1945	1954	1942	1953	1945	1942	1942

Table 2 - Average Monthly Maximum and Minimum Temperatures

Gray Soils Substation, SNOWDEN, Saskatchewan
1944-54 (11 years)

Month	Maximum	Minimum
January	5.5	-16.9
February	14.2	-10.8
March	27.4	- 0.8
April	45.8	20.3
May	61.7	33.9
June	69.6	42.2
July	75.7	48.5
August	72.6	46.2
September	62.6	36.8
October	50.1	26.1
November	27.5	10.6
December	11.7	- 9.6

Table 3 - Average Number of Frost-Free Days in Growing Season

SNOWDEN 1944-54 (11 years)

Temperature	Days
Killing frost-free period above 29°	103
Frost-free period above 32°	75

SOIL FERTILITY

Description of the Soil

The soils on the Snowden Substation where the soil fertility experimental work has been conducted, are classified as Garrick loam and Garrick heavy clay loam and were developed on lake modified boulder clay which appears to have been in part sorted by water. The nitrogen content of the surface is on the order of 0.16 to 0.24 per cent which appears to vary with the degree of original burning of the brush when the land was first cleared. The soils are nearly neutral in reaction as the pH ranges from 6.7 to 7.1. The P content is on the order of 0.08 per cent. In general where the lime accumulation is deep, over 25 inches, the B horizon is tough and compact.

Fertility Response

Fertilization has been found to have a marked influence on crop growth at Snowden. Nitrogen, sulphur or potassium alone have not had any influence on the yield of fallow cereal crops. Phosphorus alone has had some influence; however, nitrogen plus phosphorus has markedly increased the yields of wheat on fallow. Nitrogen alone has strikingly increased the yield of grain on stubble land where a heavy crop of straw was plowed down. In general, sulphur has not effectively increased the yield of hay or grain the first year of application. Potassium with nitrogen and phosphorus has in some years shown grain yield increases.

Several experiments have been conducted on the Snowden Substation from which these observations were obtained.

(a) Soil Nutrient Deficiencies

In 1949 an experiment was initiated to determine what major elements were most lacking at Snowden, Sask. The following elements and rates per acre were applied singly and in combination to wheat on fallow: nitrogen (16), phosphorus (20), potassium (20), sulphur (20).

Table 4. Effect of Major Elements on Wheat on Fallow, Snowden

Elements	Fertilizer Carrier	Rate per acre	Yield per Acre 1949-54
		lb.	bu.
No fertilizer	-	-	26.8
N	Ammonium nitrate	50	27.9
S	Sulphur	20	27.3
NS	Ammonium sulphate	80	28.9
P	Triple Superphosphate	45	34.2
NP	Amm. phosphate 11-48-0	45	35.9
	+ Amm. nitrate	36	
NPS	Amm. phosphate 16-20	100	37.5
	+ Sulphur	6	
NPKS	Amm. phosphate 16-20-0	100	36.2
	+ Pot. sulphate	40	

Phosphorus increased the yield in five years out of the six that this experiment was conducted. It will be noted sulphur had very little effect on the yield of wheat.

In a rotational study using commercial fertilizers and manure with two types of rotations--(1) fallow, wheat, oats; and (2) fallow, wheat, legume--manure very markedly increased the growth and yield of wheat and oats each year from 1947-1954 (Table 5).

Table 5. Response of Commercial Fertilizer and Manure on Yield. 1947-1954

Treatments	Nutrients added/ac				Yield per Acre		
					Wheat after		Oats after
	N	P_2O_5	K_2O	S	Oats	Legume	Wheat
	lb.	lb.	lb.	lb.	bu.	bu.	bu.
Unfertilized	0	0	0	0	22.7	24.3	44.9
Manure	-	-	-	-	37.6	39.2	60.9
11-48-0 + Am. Nit.	16	20	0	0	26.4	28.8	47.7
16-20-0 + Sulphur	16	20	0	6	26.7	27.7	47.5

In 1949 two levels of nitrogen (at 8 and 16 pounds per acre), P_2O_5 (20 and 40) and K_2O (0 and 20) were applied to wheat on fallow. In most years the application of fertilizer increased the yield of wheat although differences between the fertilizers was generally less striking. The higher level of phosphorus (40 lb. per acre) increased the yield over the lower level (20 lb.), potassium with nitrogen and phosphorus increased the yield over the check plot, and nitrogen at the higher level (16 lb.) had no effect over the lower level (8 lb. per acre). Gypsum which was also included had no effect on yield of wheat. These results are summarized in the following graph.

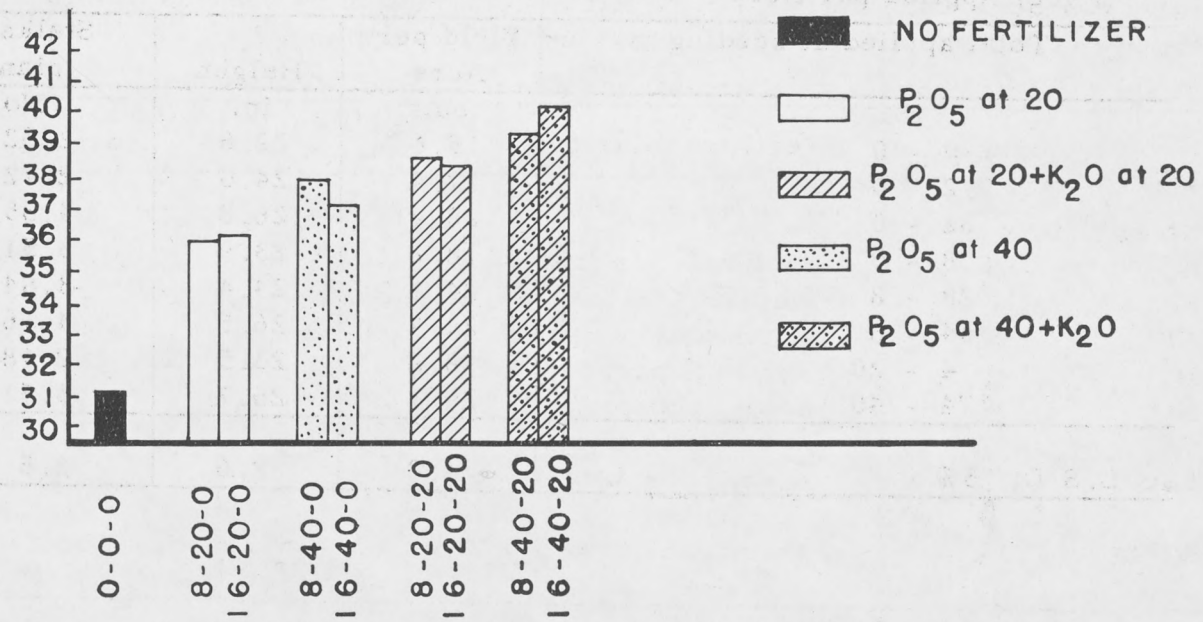

Figure 1. Yield of wheat on fallow, Snowden, Sask., 6-year average.

In 1953 ammonium nitrate fertilizer applied to barley on stubble land, which had had a heavy crop of straw plowed down the previous year, effectively increased the yield. In a replicated field strip test 11-48-0 and ammonium nitrate were drilled in or broadcast on the surface. In all cases nitrogen increased plant growth--yield, height, and stalks per plant. Nitrogen applied as ammonium nitrate and broadcast on the surface was very effective.

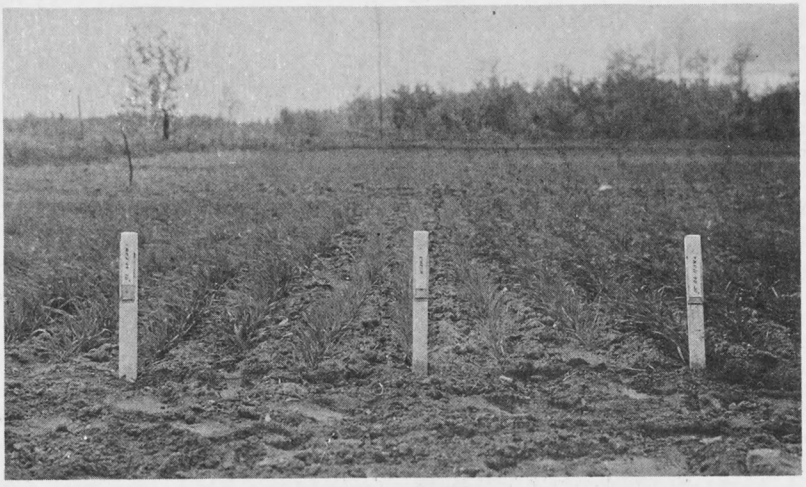

Figure 2. Effect of fertilizer applied to wheat on fallow
Left plot: A.P. 2-20-0 at 70 pounds per acre
Center: Unfertilized check
Right plot: A.P. 11-48-0 at 30 pounds per acre.

Table 6. Response of Barley After Two Crops To Nitrogen and Phosphorus

Rate of Nitrogen (N) and Phosphorus (P_2O_5) Applied per Acre	Plant Growth		
Total applied at seeding	Yield per Acre	Height	Stalks per plant
lb.	bu.	in.	No.
0 - 0	15.6	22.6	2.62
2 - 0	17.4	24.0	2.72
62 - 0	28.4	26.8	4.55
8 - 0	18.2	23.9	3.51
28 - 8	24.1	24.4	3.94
64 - 8	24.9	26.5	4.16
4 - 20	18.2	23.5	2.18
74 - 40	29.1	25.7	3.51
L.S.D. 5%	4.8	2.6	2.5

Four years data testing the commercial fertilizers 11-48-0, 16-20-0 and triple superphosphate with and without potash shows that the yield of wheat on fallow was effectively increased through their use. The ammonium phosphate fertilizers were more effective than the calcium phosphate fertilizer (T.S.P.) at equivalent rates of phosphorus. The 16-20-0 form increased the yield slightly more than the 11-48-0 form at equivalent levels of P_2O_5. Potash combined with P_2O_5 increased the yield more than P_2O_5 alone. Potash alone did not increase the yield over the unfertilized plot.

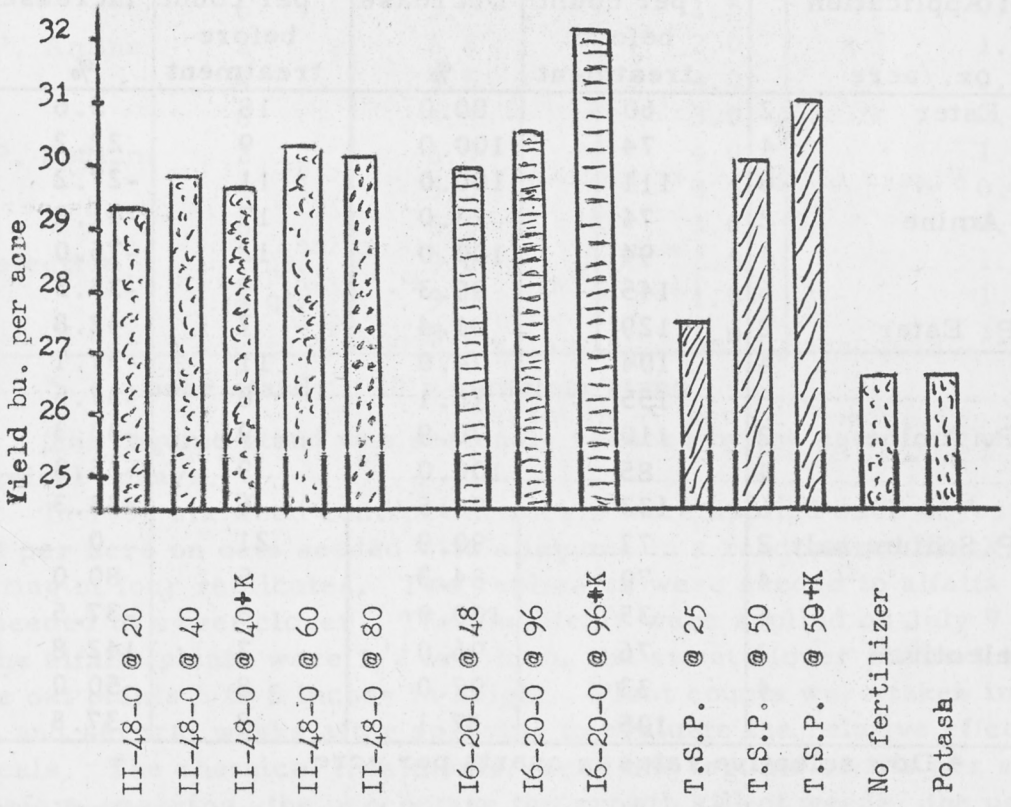

Figure 3. Effect of 11-48-0, 16-20-0, Triple Superphosphate and Potash at various rates on the yield of wheat on fallow at Snowden. 4-year average, 1951-54.

WEED CONTROL STUDIES ON GRAY WOODED SOILS

Both cultural and chemical methods are used in controlling weeds on gray wooded soils in the Snowden area. Legume crops are important in a soil-improving program and thus weed control, when these are seeded in a nurse crop, has been a problem. Experimental tests were conducted from 1952 to 1954 to test the effects of spraying various weed control chemicals on seedling stands of alfalfa. Table 7 sets forth the chemicals, rates of application, and effects that were obtained by spraying oats seeded down with an alfalfa-brome grass mixture in 1952.

Table 7 -- Chemical Weed Spray Test, Alfalfa and Oats, 1952

Chemical and Rate of Application oz./acre		Pigweed Plants		Alfalfa Plants		Yield Oats
		Seedling population per count before treatment	Decrease %	Seedling population per count before treatment	Increase %	Bu./ Acre
2,4-D Ester	2	60	80.0	18	5.6	49.9
	4	74	100.0	9	22.2	49.0
	6	111	100.0	11	-27.2	47.2
2,4-D Amine	2	74	73.0	17	-41.2	46.3
	4	94	100.0	12	-75.0	49.9
	6	145	99.3	9	-33.3	43.7
M.C.P. Ester	2	129	81.4	7	42.8	32.6
	4	104	74.0	11	-57.1	45.0
	6	155	76.1	8	-37.5	44.0
M.C.P. Amine	2	110	70.9	9	-33.3	47.1
	4	85	100.0	9	-33.3	45.5
	6	133	98.5	6	-33.3	45.8
M.C.P. Sodium salt	2	77	90.9	21	0	54.4
	4	70	84.3	5	80.0	45.9
	6	35	100.0	8	-37.5	39.0
Dow selective*	2	76	96.0	7	142.8	40.6
	4	33	97.0	8	-50.0	26.3
Check		105	57.1	8	37.5	43.3

* Dow selective rates in quarts per acre.

It is indicated from these results that good weed control was obtained in 1952 by the use of all but the very weak chemical sprays. Oat yields were increased by the use of chemicals, the highest yield being obtained on the plot treated with two ounces of M.C.P. sodium salt. The effects on the hay yield from this test were evaluated in 1953 and the results are presented in Table 8.

Table 8 -- Effects of Weed Control Chemicals on Grass Legume Hay Mixture first year after spraying (1953)

Treatment		Stand		Yield of hay 12% moisture
Chemical and rate of application oz./acre		Alfalfa	Brome	
		1 - 10[x]	1 - 10[x]	Tons/acre
2,4-D Ester	2	9.5	1.0	0.95
	4	9.0	1.5	0.83
	6	3.5	4.5	0.77
2,4-D Amine	2	8.0	1.5	1.03
	4	7.5	2.0	0.82
	6	7.5	1.5	0.74
M.C.P. Ester	2	7.0	1.5	0.82
	4	5.5	2.0	0.74
	6	3.0	1.5	0.73
M.C.P. Amine	2	6.5	2.0	1.17
	4	5.5	4.0	0.78
	6	4.0	3.0	0.77
M.C.P. Sodium	2	6.0	4.0	1.04
	4	5.0	3.5	0.76
	6	6.5	3.0	0.78
Dow selective	2 qt.	9.0	2.5	1.20
	4 qt.	9.0	1.0	1.35
Check		8.0	1.0	1.04

[x] 1 = poor stand; 10 = complete stand

The legume stand was seriously reduced by the use of higher rates of chemical sprays.

In 1953 six weed control chemicals were applied each at four ounces of acid per acre on oats seeded with a legume in a randomized block design consisting of four replicates. Two replicates were seeded to alfalfa and two were seeded to sweet clover. The chemicals were applied on July 9 at which time the alfalfa plants were 1/2 to 1 inch, the sweet clover plants 1 to 3 inches, and the oat plants 6 to 8 inches in height. Plant counts were taken immediately before and several weeks after spraying to evaluate the relative effects of the chemicals. The chemical treatments, weed and legume counts per square yard before spraying, the percentage top growth kill of weeds, the percentage increase in number of sweet clover and alfalfa plants, and the yield of oats obtained in 1953 are presented in Table 9.

Table 9 - Chemical Weed Spray Test, Legumes and Oats, Snowden, 1953

Chemical and Rate of Application oz./acre	Pigweed Plants		Legume Stands				Alfalfa and Sweet Clover	Yield Oats
			Alfalfa		Sweet Clover			
	Seedling population per sq. yd. before treatment	Decrease %	Seedling population per sq. yd. before treatment	Increase %	Seedling population before treatment per sq. yd.	Increase %	Increase %	Bu./ Acre
2, 4-D Amine 4	398.7	70.5	94.5	38.0	185.0	91.0	64.5	16.1
2, 4-D Ester 4	252.0	94.0	76.5	27.5	171.0	23.5	25.6	15.5
M.C.P. Sodium 4	245.7	53.5	81.0	71.0	162.0	121.5	96.2	17.5
M.C.P. Amine 4	247.5	70.5	72.0	80.0	158.0	101.5	90.7	17.5
L.V.4 2, 4-D Ester 4	290.7	60.2	103.5	60.0	180.0	124.5	92.2	17.6
M.C.P. Ester 4	292.5	79.5	85.5	42.0	135.0	101.0	72.2	19.0
Check	362.7	12.8	85.5	41.5	203.0	113.5	77.5	16.8
L.S.D.		28.0		No sig.		51.3	42.1	No sig.

From the data in Table 9, it will be noted that the Ester formulation of 2, 4-D had a greater effect on the pigweed, alfalfa, and sweet clover stands than any other chemical. Excellent weed control was obtained with this chemical but although the legumes were not killed out completely, their stands were significantly reduced. The 2, 4-D formulations of Ester, Amine and Ester low volatile gave weed kills of 94.0 per cent, 70.5 per cent and 60.2 per cent respectively. M.C.P. formulations of Ester, Amine, and Sodium gave weed kills of 79.5 per cent, 70.5 per cent and 53.5 per cent respectively. The data indicates that although excellent weed control is obtained with Ester 2, 4-D, its effects on the seedling legumes in the crop are more severe than M.C.P. chemical treatments. There was no significant difference between the treatments in the yield of oats in 1953.

The hay yields that were harvested from this test in 1954 are presented in Table 10.

Table 10 - Average Stand and Yield of Alfalfa and Sweet Clover Sprayed in 1953, SNOWDEN 1954

Chemical and Rate of Application in ounces per acre	Ground Area Covered	Yield per Acre (air dry weight)		
		Sweet Clover	Alfalfa	Average
	%	ton	ton	ton
2,4-D Amine 4	85	0.63	1.05	0.84
2,4-D Ester 4	50	0.35	0.78	0.57
M.C.P. Sodium 4	96	0.75	1.12	0.93
M.C.P. Amine 4	88	0.67	1.04	0.85
L.V.4-2,4-D Ester 4	86	0.69	1.10	0.89
M.C.P. Ester 4	83	0.65	1.10	0.87
Check	94	0.66	1.10	0.87
L.S.D. 5%				0.11
1%				0.15

The yield of legume hay was significantly reduced by spraying the seedling stand with 2,4-D Ester for weed control. There was no significant difference between the yield of hay from other chemical treatments.

CEREAL CROPS

Rate of Seeding:

In this test, wheat is seeded at 75 and 105 pounds per acre; oats at 51 and 85 pounds, and barley at 72 and 120 pounds. Ammonium phosphate 11-48-0 fertilizer is applied at 30 pounds per acre and the test is conducted in replicated and randomized rod-row plots.

Yields which have been obtained from the various rates of seeding wheat, oats, and barley with and without fertilizer at Snowden are presented in Table 11.

The highest rate of seeding tested, plus fertilizer, has consistently produced the highest yield with all crops at Snowden.

When the rate of seeding wheat in the following test was increased from 75 pounds (1 1/4 bushels) to 105 pounds (1 3/4 bushels) per acre and 11-48-0 fertilizer was applied, the yield was increased by 3.6 bushels per acre on the average of seven year's testing.

Increasing the rate of seeding oats from 51 pounds (1 1/2 bushels) to 85 pounds (2 1/2 bushels) per acre increased the yield by 5.2 bushels per acre when both treatments were fertilized. The increase obtained by the use of the heavier rate of seeding barley on the basis of the seven-year average was 6.4 bushels per acre.

Table 11 - Seven-Year Average Yield of Wheat, Oats, and Barley at Varying Rates of Seeding, with and without Fertilizer, SNOWDEN, Sask.

Wheat		Oats		Barley	
Rate of seeding and treatment	Yield /acre	Rate of seeding and treatment	Yield /acre	Rate of seeding and treatment	Yield /acre
	bu.		bu.		bu.
105 lb. unfertilized	27.9	85 lb. unfertilized	64.4	120 lb. unfertilized	43.2
105 lb. fertilized	30.7	85 lb. fertilized	72.1	120 lb. fertilized	50.1
75 lb. unfertilized	26.8	51 lb. unfertilized	56.3	72 lb. unfertilized	37.5
75 lb. fertilized	27.1	51 lb. fertilized	66.9	72 lb. fertilized	43.7

Cereal Variety Tests:

New and promising varieties of cereal grains are continually being tested on the Substation to determine their suitability to growing under gray wooded soil conditions. These tests are conducted in replicated and randomized rod-row plots where differences in yield and other agronomic characteristics can be evaluated. The information obtained from these tests is used in formulating zoning recommendations.

The growing season is generally short in the Gray Wooded Soils area. Thus, early maturing varieties are important.

Since its introduction in 1939, Thatcher has remained the leading variety in so far as wheat production on these soils is concerned. In oats, Exeter has been the highest yielding variety tested while in barley, Husky, Vantage and Montcalm have proved satisfactory varieties from a yield standpoint in the area. Redwing flax, an early maturing variety, has been the only variety generally recommended for growing under gray wooded soil conditions in northeastern Saskatchewan.

The testing of varieties of cereal crops has generally been done on fallow land but in 1954 a test of wheat, oats, and barley was grown on stubble land to determine the most suitable kind of grain to grow as a second crop in the area.

Table 12 sets forth the yield in pounds per acre that each kind of grain produced in the first year of the test.

In analyzing this test, Thatcher wheat was used as the control. Montcalm barley produced the highest yield in pounds per acre of grain in 1954.

Coarse grains have proved an important crop on the gray wooded soils of northeastern Saskatchewan and thus a variety test including twenty standard and new varieties of barley has been conducted for the past two years.

Table 12 - Yield of Cereal Grains on Stubble Land SNOWDEN 1954

Thatcher Wheat	Exeter Oats	Vantage Barley	Montcalm Barley	L.S.D.
972.0	1,590.9**	1,681.1**	1,727.7**	353.0

** Yield highly significant over control.

The performance of the varieties in the National Barley Test during the 1953-54 seasons is presented in Table 13.

Table 13 -- Performance of Barley Varieties National Barley Test, SNOWDEN

Variety	1954				Average of years 1953-1954			
	Yield /acre	Days to mature	Length of straw	Weight per bushel	Yield /acre	Days to mature 1953	Length of straw	Weight per bushel
	bu.	no.	in.	lb.	bu.		in.	lb.
Br.3902	34.4	118	30.8	45.4				
U.M.570	34.8	118	32.0	42.4	32.6	91.0	27.8	43.7
Br.3139	27.8	118	30.3	37.3				
U.M.584	29.4	118	33.3	40.4	32.5	91.8	28.6	42.7
Vantmore	34.6	118	28.0	40.6	35.2	92.5	27.6	44.3
Br.547	31.4	118	30.8	40.5	37.6	91.3	28.8	43.8
Br.3833	29.2	118	30.5	42.3	34.2	93.3	26.3	46.7
Wolfe	26.0	118	24.0	42.5	34.2	85.0	24.8	43.8
Vantage	26.5	118	28.3	40.0	32.8	92.5	25.3	44.3
Montcalm	32.1	118	32.8	39.3	35.4	91.3	29.3	43.7
O.A.C.21	26.2	118	30.3	38.5	31.1	90.3	27.4	42.3
Husky	39.0	118	32.0	41.5	41.9	94.0	27.0	46.0
Scott 169	38.5	118	27.8	35.8				
U.M.913	34.2	118	32.3	41.6	32.7	92.8	25.0	43.3
Scott 62	31.9	118	30.0	41.5	28.0	93.3	27.0	43.4
U.M.1623	20.6	118	30.0	37.8	37.9	92.0	27.7	45.3
Br.3878	31.9	118	30.0	40.6	28.4	89.3	29.2	43.9
Sask.5203	20.2	118	30.8	40.4				
Brant	29.0	118	27.0	36.3				
N.D. 103	20.6	118	28.8	39.6				
L.S.D.	8.96							

Husky, a new six-rowed feed barley, was the highest yielding variety on the basis of the 1954 and the two-year average results.

Fall-Seeded Grains:

Fall-seeded cereal crops were tested at Snowden in replicated and randomized rod-row plots. The seedings were made in the fall of 1951 and 1952 and the yields which were produced in the following growing seasons are presented in Table 14.

Table 14--Yield of Fall-Seeded Crops, SNOWDEN

Variety and Treatment	Yield, Bushels per Acre		
	1952	1953	2-year average
Russian fall rye (unfertilized)	51.0	25.5	36.3
Russian fall rye (fertilized)	40.2	28.1	34.2
Dakold fall rye (fertilized)	52.7	27.9	40.3
Dakold fall rye (unfertilized)	34.4	29.9	42.2
Yogo fall wheat (unfertilized)	37.4	23.0	30.2
Jones Fife fall wheat (unfertilized)	0.0	0.0	0.0
Karkov fall wheat (unfertilized)	31.8	14.3	23.1
Rideau fall wheat (unfertilized)	0.0	0.0	0.0
L.S.D. 5% level	2.84	2.55	
L.S.D. 1% level	4.44	3.77	

Jones Fife and Rideau varieties of fall wheat winterkilled completely in this area during the winters that the test was conducted. Dakold out-yielded the Russian variety of fall rye. The use of 11-48-0 fertilizer seeded with fall rye seed had little apparent effect on the yield on the basis of the two years which the test has been conducted.

Field Peas:

Several varieties of field peas were tested at Snowden in replicated and randomized rod-row plots. Table 15 sets forth the results that have been obtained.

Table 15 - Average Yield per Acre of Field Pea Varieties, Snowden

Variety of Pea	7-year average yield 1946-50 and 1952-53	5-year average yield 1948-50 and 1952-53	2-year average yield 1952-53
	bu.	bu.	bu.
Authur	25.3	30.1	40.5
Early Blue	25.6	29.9	40.4
Chancellor	24.8	30.6	45.8
Dashaway			42.0
Valley		31.7	43.9

Chancellor, a small-seeded early maturing variety, has yielded well in comparison with the other varieties tested. Valley, a new variety, yielded well in the tests where it was compared.

FORAGE CROPS

Experimental work with forage crops is being conducted on the Substation, Snowden, to determine the most suitable grasses, legumes and grass-legume mixtures to be grown for hay, pasture, and seed production.

Several varieties of grasses and grass-legume mixtures were evaluated in a single replicate test which was reseeded as required but which ran continuously from 1944 to 1954.

Table 16 sets forth the varieties compared in this test and the yields which were obtained.

Table 16 - Yield of Forage Varieties and Mixtures SNOWDEN 1944-1954

Variety or Mixture	11-year average yield air dry hay tons per acre
Alfalfa Grimm	1.11
Alfalfa Viking	1.09
Alfalfa Ladak	1.03
Alfalfa Cossack	0.89
Crested Wheat S-31.6-1 (Summit)	1.43*
Crested Wheat (Fairway)	1.19
Western Rye	1.19
Brome (Commercial)	1.18
Creeping Red Fescue (Duraturf)	0.59
Russian Wild Rye	0.97*
Canadian Wild Rye	1.50*
Alfalfa and Crested Wheat (Fairway)	1.53
Alfalfa and Brome (Commercial)	1.67
Alfalfa, Brome, and Crested Wheat	1.27*
Brome and Crested Wheat	0.87*

* 6-year average

Yields from this test indicate that over the eleven-year period a mixture of Grimm alfalfa and Commercial brome grass has given the highest yield of cured hay producing on the average 1.67 tons per acre. In the pure stands of alfalfa, Grimm was the highest yielding variety tested producing on the average 1.11 tons of cured hay per acre.

To evaluate more closely the yields which were being obtained from the grass and legume varieties and mixtures, a replicated and randomized

test was seeded in 1951. This test consisted of a rod-row four-replicate, randomized block design in which twenty species, strains, and varieties were tested.

Table 17 sets forth the yields that were obtained from the grasses and legumes tested./

Table 17 - Yield of Forage Varieties and Mixtures in Replicated Forage Test, SNOWDEN, 1952-1953

Variety, Strain, or Mixture	Yield of Forage, Air Dry Weight Tons per Acre		
	1952	1953	Average
Alfalfa -- Ladak	0.46	0.46	0.46
Grimm	0.50	0.52	0.51
Rhizoma	0.76	0.85	0.80
Red Clover -- Altaswede	0.55	0.91	0.73
Manhardy	0.34	0.65	0.49
Brome -- Commercial	0.34	0.23	0.29
Crested Wheat -- Fairway	0.44	0.38	0.41
Creeping Red Fescue -- Duraturf	0.27	0.25	0.26
Western Rye Grass	0.26	0.47	0.37
Russian Wild Rye	0.02	0.29	0.10
Alfalfa and Creeping Red Fescue*	0.36	0.83	0.59
Alfalfa and Crested Wheat Grass*	0.65	0.66	0.66
Alfalfa and Brome Grass*	0.52	0.73	0.62
Alfalfa, Brome and Crested Wheat*	0.77	0.86	0.82
Alfalfa and Timothy*	0.41	0.57	0.49
Birdsfoot Trefoil, Brome and Crested Wheat	0.42	0.54	0.48
Sweet Clover and Crested Wheat Grass	0.68	0.41	0.54
Sweet Clover and Brome Grass	0.72	0.27	0.49
Alfalfa, Brome, and Crested Wheat**	0.62	0.93	0.77
Red Clover, Brome, and Crested Wheat	0.61	0.59	0.60
L.S.D. 5%	0.37	0.52	0.35
L.S.D. 1%	--	0.68	0.46

* Grimm alfalfa

** Rhizoma alfalfa

The data in Table 14 indicate that the highest yield of forage was obtained from a grass-legume mixture, alfalfa, brome, and crested wheat grass. Brome or crested wheat grass when seeded in mixtures with alfalfa have consistently given high yields of good quality forage on the gray wooded soils of the Snowden district.

HORTICULTURAL CROPS

A potato variety test has been conducted on gray wooded soil on the Snowden Substation for the past six years. Seven varieties of potatoes have been tested in eight hill plots in a randomized block design with four replications. The yields which were produced from the varieties tested are presented in Table 18.

Table 18 - Potato Variety Test, Yield per Acre, Snowden

Variety	6-year Average--1949-54		
	Total yield	Table sized tubers	
	bu.	bu.	Percentage of total yield
Manchester	302.0	256.8	85.0
Early Carter	286.8	230.8	80.5
Irish Cobbler	284.1	249.8	87.9
Netted Gem	259.8	199.5	76.8
Warba	289.6	238.3	82.3
Early Ohio	235.9	190.8	80.9
Red Pontiac	322.5	284.1	88.1

On the six-year average basis, Red Pontiac and Manchester produced the highest yield of table-sized tubers. Netted Gem, a medium late maturing but excellent keeping variety, was one of the lowest yielders in the test. Red Pontiac and Irish Cobbler produced the highest percentage of table-sized potatoes.

Vegetable Garden

Each year, a family-sized demonstration vegetable garden including new and recommended varieties of vegetables is grown on the Station. The varieties in this garden are evaluated as to yield, date of maturity, and quality by the Substation operator's family. The information obtained from this test is used in evaluating on a consumer basis the varieties included in recommended vegetable variety lists for the area. Medium early maturing varieties of recommended vegetable crops generally produce fairly good yields of quality vegetables on the gray wooded soils of the Snowden area.

Ample supplies of vegetables have been produced each year from a small garden area to supply the operator's farm family need on the Snowden Substation.

Establishment of a Farm Orchard

A small farm orchard was established on the Snowden Substation in 1943. Plantings in this orchard included crabapples, plum, plum-cherry hybrids and bush fruit trees. The orchard is well sheltered on the west and

north and fairly good success has been obtained. Many of the varieties have produced a good supply of fruit over the past twelve years.

Although the trees of Opata, Sapa, and Dura, plum-cherry hybrids, and those of Assiniboia, Pembina, and Grenville, true plum, produced some fruit a few years after planting, they have all winterkilled and were replaced in 1953 and 1954 with crabapples and hardier varieties of plums and plum-cherry hybrids.

Figure 4. Opata plum-cherry hybrid loaded with fruit 6 years after planting, Snowden, 1949.

Crabapple trees planted in 1943 began production in 1952. The yields of the varieties grown are presented in Table 19.

Table 19 - Crabapple Variety Fruit Yields. Snowden, 1952-54

Variety and Kind of Tree	Average Yield Per Acre				
	1952	1953	1954	1953-54 2-year av.	1952-54 3-year av.
	lb.	lb.	lb.	lb.	lb.
Florence crab	30	52	72	62	54
Osman crab	15	60	22	41	32
Columbia crab	43	64	71	67	59
Bedford crab	26	15	19	17	20
Trail crab	0	10	5	7	--
Rosilda crab	0	0	8	--	--
Toba crab	0	0	5	--	--
Bounty plum	0	0	10	--	--

The data presented in Table 19 indicate that fairly good yields of fruit were produced by all varieties in 1954. Columbia, Florence, and Osman crabapples are the highest yielding varieties tested. Trees of these varieties have stood severe winters with little killing and are now producing a good supply of fruit.

FIELD DAYS

An annual Field Day is held on the Substation for the purpose of allowing the farmers in the area to view the experimental work which is being done on gray wooded soils. At these Field Days, the farmers are taken on a conducted tour through the active experimental projects and ample time is allowed for discussions on major agricultural problems of the area.

These Field Days are held in co-operation with municipal and provincial extension services and representatives of the various Departments take part in the discussion. During the period 1943 to 1954, eleven Field Days were held on the Snowden Substation and these were attended by 1,003 farmers, an average of 91 per meeting. Interest among farmers in the experimental work which is being done on the Station has increased as the work and results have developed. This is indicated by the fact that during the period 1950-54, inclusive, a total of 575 farmers, an average of 115 per meeting, have attended the annual Field Day.